

## LESSON 5: INTRODUCTION TO MSDSS AND MSDS PHYSICAL HAZARD INFORMATION

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### INTRODUCTION

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Material Safety Data Sheets (MSDSs) contain a great deal of useful information about chemical hazards. You have a right to review a copy of the MSDS for any chemical material in your work area simply by asking. This lesson helps you understand how to read an MSDS. You will see what kinds of general information and physical data the MSDS contains. Then you will see how to use MSDSS to help protect yourself from physical hazards of the hazardous chemicals in your workplace.

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### LEARNING OBJECTIVES

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When you have completed this lesson, you should be able to do the following

- Identify general information that must be contained on an MSDS.

- Use physical data on an MSDS to answer the following questions about a chemical material:

  - Is it a solid, a liquid, or a gas?

    - Can I see it?

    - Might I smell it?

    - How fast does it evaporate?

    - How much of it can evaporate?

    - How much force does its vapor exert inside a closed container?

    - Is it heavier than air or lighter than air?

    - Is it heavier than water or lighter than water?

    - Is it soluble in water?

    - Does it float on water or sink in water?

- Use physical data on an MSDS to compare the vapor hazards of liquid chemicals.

- Use MSDS physical hazard information to answer the following questions:

  - Can the chemical cause fires?

  - How do I put out a fire?

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**LEARNING OBJECTIVES**

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**Continued**

Can the chemical explode?

[s the chemical unstable or reactive?

What conditions or materials must be avoided?

How do I clean up a spill or leak?

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**LEARNING RESOURCES**

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- Videotape Segment 5A: Physical Characteristics Information
- Workbook Application Exercise 5A-1: Understanding General Information and Physical Data on MSDSS
- Workbook Application Exercise 5A-2: Using General Information and Physical Data on MSDSS
- Videotape Segment 5B: Physical Hazard Information
- Workbook Application Exercise 5B-1: Understanding MSDS Physical Hazard Information
- Workbook Application Exercise 5B-2: Using MSDS Physical Hazard Information
- Lesson Summary

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**DIRECTIONS FOR PROCEEDING**

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*Complete the following steps in order. You might want to check off each step as you complete it.*

- 1) Read the workbook introduction to Videotape Segment 5A.
- 2) Watch Videotape Segment 5A.
- \_\_\_ 3) Complete Application Exercise 5A-1 in this workbook.
- \_\_\_ 4) Complete Application Exercise 5A-2 in this workbook.
- \_\_\_ 5) Read the workbook introduction to Videotape Segment 5B.
- \_\_\_ 6) Watch Videotape Segment 5B.
- \_\_\_ 7) Complete Application Exercise 5B-1 in this workbook.
- \_\_\_ 8) Complete Application Exercise 5B-2 in this workbook.
- \_\_\_ 9) Read the Lesson Summary.

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## INTRODUCTION TO VIDEOTAPE SEGMENT 5A

### Physical Characteristic Information

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Every MSDS must contain certain kinds of information about the organization that prepared the document, the identity of the chemical material, and the material's physical properties.

As you watch this videotape segment, look for the kinds of general information that the MSDS must contain. Pay particular attention to the information included in the Physical Data Section. Notice how this data can help you recognize chemical materials, vapor hazards, and special **fire** hazards.

Now, watch Videotape Segment 5A.

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**NOTES**

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**APPLICATION EXERCISE 5A-1 :**  
**Understanding General Information and Physical Data on MSDSS**

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*Directions: Check or circle your answer(s) to each question, or write your answer in the blank provided. Remember, there may be more than one correct choice for a question. When you complete the exercise, fold over the right side of the page to check your answers. Then turn the page to get more information about each question.*

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1) What information must the MSDS contain about the party who prepared the document?

- A) Name
- B) Address
- C) Phone number

2) Can an MSDS include more than one name for a chemical material?

- A) Yes
- B) No

3) If the chemical material is a mixture, what must the MSDS identify?

- A) Paints or coatings that are safe to use with it
- B) Name of each hazardous ingredient
- C) Other similar mixtures of liquids, solids, or gases

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**APPLICATION EXERCISE 5A-1 :**  
**Understanding General Information and Physical Data on MSDSS**

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<b>Answer</b>	<b>Additional Information</b>
1) ABC	<p>Every MSDS must contain the name, address, and telephone number of the party responsible for preparing the document.</p> <p>OSHA requires this information so that you can easily contact the responsible <b>party</b>.</p>
2) A	<p>One name on the MSDS must be the same as the name used on the label and the Hazardous Chemical Inventory in your workplace. But many chemical materials have more than one name. So, you may also see synonyms or trade names. The MSDS may also tell you that the material belongs to a chemical <b>family</b> or has a particular <b>chemical</b> structure. Section (g)(2) of the <b>Hazard Communication Standard (29CFR 1910.1200)</b> contains very specific requirements for identifying chemicals on the <b>MSDS</b>.</p>
3) B	<p>Mixtures contain more than one ingredient. If the material is a mixture, the MSDS must <b>identify</b> all the hazardous ingredients.</p> <p>Paints, preservatives, solvents, alloys, and metallic coatings are common mixtures, but any solid, liquid, or gas can be a mixture.</p>

4) Which chemical gets into the air faster?

A)	Evaporation Rate 0.35 (Water = 1)
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B)	Evaporation Rate 3.5 (Water = 1)
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5) What does vapor pressure tell you?

- A) How fast a chemical gets into the air.
- B) How much of the chemical can evaporate.
- C) Whether the vapor is lighter or heavier than air.
- D) How much force the vapor exerts inside a closed container.

**Answer      Additional Information**

- 4) B      Evaporation rates are reported as comparisons. The evaporation rate tells you HOW FAST a liquid evaporates compared to water, in this case, the standard, which has an evaporation rate of one. That is, it tells you how quickly vapors get into the air from an exposed liquid surface.

Evaporation Rate (Water = 1)	Meaning
Less than 1(< 1)	Vaporizes <i>SLOWER</i> than water
1	<i>SAME</i> rate as water
More than 1(> 1)	Vaporizes <i>FASTER</i> than water

- 5) A, B, D      Vapor forms above the liquid surface inside a closed container. This vapor exerts a force on the walls of the container. The force is the vapor pressure of the liquid.
- Like air pressure, vapor pressure is measured in millimeters of mercury (mm Hg). Vapor pressure increases as the temperature of a liquid rises.
- Liquids with high vapor pressures at room temperature (greater than about 100 mm Hg) present a special hazard. The pressure inside a sealed container can make the container swell or burst open. This releases a hazard and is most likely to happen if a sealed container is exposed to heat.
- Given a closed room, vapor pressure can tell you how much liquid will evaporate.
- High vapor pressure will tell you how fast it gets into the air, as well.



6) Which vapor tends to sink in still air?

A) Vapor Density 0.80  
(Air = 1)

B) Vapor Density 1.52  
(Air = 1)

7) Which liquid is lighter than water?

A) Specific Gravity 0.60  
(Water = 1)

B) Specific Gravity 1.80  
(Water = 1)

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*Now go back to page 5-5, fold over the right side of the page, and check your answers. Look on the back of the question page for more information on each question. If you are taking this course as a self-study, proceed to Application Exercise 5A-2, "Using General Information and Physical Data on MSDSS, " when you have finished. If you are taking this course in a classroom situation, wait for further instructions from your trainer when finished.*

**Answer      Additional Information**

- 6) B      Vapor density tells you whether a vapor is lighter than air or heavier than air, which has a density of 1.

<b>Vapor Density (Air = 1)</b>	<b>Meaning</b>
Less than 1 (< 1)	<i>LIGHTER</i> than air. Tends to <i>RISE</i> , and get out of your breathing zone.
Greater than 1 (> 1)	<i>HEAVIER</i> than air. Tends to <i>SINK</i> , stay in your breathing zone, and accumulate in low spots.

Note: *If the air around the vapor is turbulent (breezy), the vapor may mix with air and become close to 1.*

- 7) A      Specific gravity tells you whether a liquid is lighter than water or heavier than water, which has a specific gravity of 1.

<b>Specific Gravity (Water = 1)</b>	<b>Meaning</b>
Less than 1 (< 1)	<i>LIGHTER</i> than water. <i>FLOATS</i> if not soluble in water.
Greater than 1 (> 1)	<i>HEAVIER</i> than water. <i>SINKS</i> if not soluble in water.

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**APPLICATION EXERCISE 5A-2:**  
**Using General Information and Physical Data on MSDSs**

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*Directions: Check or **circle** your answer(s) to **each** question, or write your answer in the blank provided. **Remember**, there maybe more than one correct choice for a question. When you complete the exercise, fold over the right side of the page to check your answers. Then turn the page to get more information about **each** question.*

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*Locate the MSDS for Automatic Transmission Fluid in Appendix A and use it to answer the following questions.*

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- 1) What should you do if you need more information about Automatic Transmission Fluid in an emergency situation?
  - A) Call 318-555-5214
  - B) Call a doctor
  - C) Write PO Box 3758, Anytown, OK 74000
  - D) Write OSHA
  
- 2) Is this transmission fluid a mixture?
  - A) Yes
  - B) No

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**APPLICATION EXERCISE 5A-2:**  
**Using General Information and Physical Data on MSDSS**

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**Answer      Additional Information**

The MSDS for Automatic Transmission Fluid is located on pages A-4 to A-5 in Appendix A.

1) A      Section 1 of the MSDS gives you an emergency telephone number to call for assistance. Calling this number is usually the fastest way to get the answers you need in an emergency situation. This puts you in immediate contact with the manufacturer or party responsible for preparing the MSDS. Writing for answers only works when you can afford to wait for the information.

Most physicians know little or nothing about transmission fluid. With hundreds of thousands of chemical materials in use, you cannot expect OSHA to have specific information about any one product.

2) A      Look at Section 2 of the MSDS. It lists three ingredients: refined oils, anti-oxidant, and dye. Any material that contains two or more different ingredients is a mixture.

3) What is the material's physical form?

A) Solid

B) Liquid

g) Gas

4) How might you sense release of this transmission fluid in your workplace?

A) See it

B) Smell it

C) Can't sense it — chemical is invisible and odorless

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*Now go back to page 5-11, fold over the right side of the page, and check your answers. Look on the back of the question page for more information on each question. **If you are taking this course as a self-study, read the introduction to Videotape Segment 5B when you have finished. If you are taking this course in a classroom situation, wait for further instructions from your trainer when finished.***

<b>Answer</b>	<b>Additional Information</b>
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3) B	Look at the APPEARANCE& ODOR information in the Physical and Chemical Characteristics Section, Section 3. It tells you that the material is a red, oily liquid.
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4) A B	Again, look at the APPEARANCE& ODOR information in Section 3. It tells you that the material is a red, oily liquid. You can see the liquid, but you probably cannot see the vapor or mist that can be formed from the liquid. The MSDS also tells you that this transmission fluid has a slightly oily odor. This means you can smell it, but the odor is faint. So you may not notice the smell — especially if the air you are breathing contains only small amounts of vapor.
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## **INTRODUCTION TO VIDEOTAPE SEGMENT 5B:**

### **Physical Hazard Information**

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You have seen that physical hazards include explosion hazards, fire hazards, and unstable or reactive chemicals. The **MSDS** identifies these types of hazards and provides information to help you control them.

As you watch this videotape, look for the kinds of information contained in the Fire and Explosion Hazard Data Section of the MSDS, and learn how to identify these hazards. Learn to use the Reactivity Data Section to identify unstable or reactive chemicals, and watch for ways of preventing hazardous reactions in the workplace. Finally, notice how the Precautions for Safe Handling and Use Section helps you clean up chemical spills or leaks correctly and dispose of the chemical waste properly.

Now, watch Videotape Segment 5B.





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**APPLICATION EXERCISE 5B-1 :**  
**Understanding MSDS Physical Hazard Information**

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*Directions: Check or circle your answer(s) to each question, or write your answer in the blank provided. Remember, there may be more than one **correct** choice for a question. When you complete the exercise, fold over the right side of the page to check your answers. Then turn the page to get more information about each question.*

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1) Which chemical material is **flammable**?

A)	Flash Point	70°F
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B)	Flash Point	150°F
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2) For which materials must the MSDS list *CONDITIONS* to avoid?

- A) Unstable chemicals
- B) Reactive chemicals
- C) Polymerization hazards

3) If the MSDS lists *MATERIALS* to avoid, what kind of hazard is the chemical?

- A) Unstable
  - B) **Flammable**
  - C) Reactive
  - D) Combustible
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*Now fold over the right side of the page, and check your answers. Look on the back of the question page for more information on each question. If you are taking this course as a self-study, continue to Application Exercise 5B-2, "Using MSDS Physical Hazard Information," when you have finished. If you are taking this course in a classroom situation, wait for further instructions from your trainer when finished.*

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**APPLICATION EXERCISE 5B-I :**  
**Understanding MSDS Physical Hazard Information**

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<b>Answer</b>	<b>Additional Information</b>
1) A	<p>The flash point is the lowest temperature at which a liquid gives off enough vapor to ignite in the presence of an ignition source, such as a match, spark, or cigarette.</p> <p><i>FLAMMABLE</i> liquids have flash points below 100°F.</p> <p><i>COMBUSTIBLE</i> liquids have flash points at or above 100°F.</p>
2) ABC	<p>The Reactivity Data Section of the MSDS lists conditions to avoid for unstable chemicals and polymerization hazards and incompatible reactions or materials. The conditions to avoid are those that might cause the chemical to decompose (break down into simpler molecules), or to polymerize (self-react to form large molecules).</p>
3) c	<p>Reactive chemicals become hazardous when in contact with certain other chemical materials. Contact may cause a fire, explosion, or other violent chemical reaction. It may also produce or release a hazardous chemical.</p> <p>For this reason, the Reactivity Data Section lists materials to avoid for reactive chemicals.</p>

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## APPLICATION EXERCISE 5B-2: Using Physical Data on MSDSs

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*Directions: Check or **circle** your answer(s) to each question, or write your answer in the blank provided. Remember, **there** may be more than one correct choice for a question. When you complete the exercise, **fold** over the right side of **the page** to **check** your answers. Then turn the page to get **more** information about each question.*

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*Locate the MSDS for Crystal Clear in Appendix A and use it to answer the following questions.*

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- 1) What type(s) of physical hazards does Crystal Clear present?
    - A) Fire
    - B) Explosion
    - C) Unstable
    - D) Reactive
    - E) Polymerization
  
  - 2) Crystal Clear produces a hazardous situation when it comes in contact with:
    - A) Corrosives
    - B) Certain metals
    - C) Water
    - D) Air
  
  - 3) Does Crystal Clear produce any hazards when it burns or breaks down into simpler chemicals?
    - A) Yes
    - B) No
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*Now fold over the right side of the page, and check your answers. Look on the back of the question page for more information on each question. If you are taking this course as a self-study, either review Videotape Segment 5B or proceed to the Lesson Summary when you have finished. If you **are** taking this course in a classroom situation, wait for further instructions **from** your trainer.*

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## APPLICATION EXERCISE 5B-2: Using Physical Data on MSDSS

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### Answer

### Additional Information

The MSDS for Crystal Clear is located on pages A-2 and A-3 of Appendix A.

1) A B D

Look at the Fire and Explosion Hazard Data given in Section 4 of the MSDS. Crystal Clear is a **fire** hazard because it contains a flammable gas. It's an explosion hazard because explosive limits (LEL and UEL) are given.

The Reactivity Data in Section 5 of the MSDS tells you that Crystal Clear is stable, and that it does not undergo hazardous polymerization. It also tells you two kinds of materials to avoid — corrosives and active metals. Whenever the MSDS lists materials to avoid, the chemical is reactive.

2) A B

Look at the MATERIALS TO AVOID listed in the Reactivity Data Section. It tells you to keep Crystal Clear away from corrosives and active metals, **such as aluminum and magnesium**. Whenever the MSDS lists Materials to Avoid, it means that contact with these materials can produce or release a hazard.

3) A

Look at the HAZARDOUS DECOMPOSITION PRODUCTS listed in the Reactivity Data Section. All four chemicals listed are toxic gases formed when Crystal Clear burns or decomposes. Carbon monoxide, phosgene and hydrogen chloride are deadly.

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## LESSON 5 SUMMARY

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Every MSDS must contain the following general information,

- . Name, address, and telephone number of the party responsible for preparing or distributing the MSDS, who can provide additional information on the hazardous chemical and appropriate emergency procedures.
- . Name of the chemical material as it appears on the warning label and Hazardous Chemical Inventory in your workplace.
- . Health hazards of the chemical, including signs and symptoms of exposure,
- . Precautions for safe handling and use.
- . Any applicable control measures.

Many chemical materials are mixtures. Mixtures contain more than one ingredient. The MSDS must identify **ALL** hazardous ingredients in a mixture.

The following table summarizes the information you will find in the **Physical Data Section** of the MSDS.

Physical Data	Question Answered	Explanation
APPEARANCE AND ODOR	Solid, liquid, or gas? What does it look like? Can I see/smell it?	MSDS describes physical form/appearance, color, and odor (if any).
BOILING POINT	Is it a gas?	YES if boiling point is BELOW room temperature
EVAPORATION RATE (STANDARD = 1)	How FAST does it evaporate?	FASTER than standard if rate GREATER than 1. SLOWER than standard if rate LESS than 1.
VAPOR PRESSURE (mm Hg)	How much FORCE does the vapor exert inside a closed container?	Higher is more hazardous. Over 100 mm Hg may cause container to burst open upon exposure to heat.
VAPOR DENSITY (Air = 1)	Is it heavier than air or lighter than air?	HEAVIER if GREATER than 1. LIGHTER if LESS than 1.
SPECIFIC GRAVITY (Water = 1)	Is it heavier than water or lighter than water?	HEAVIER if GREATER than 1. LIGHTER if LESS than 1.
VOLUBILITY IN WATER	Is it soluble in water?	NO if volubility none or a number near zero.

Liquids that are not soluble in water either float (**specific gravity less than 1**) or sink (**specific gravity greater than 1**). Liquids that float on water present a special fire hazard. Water does not stop such liquids from burning. Instead, water spreads the fire.

Physical hazard information appears in the following sections of the MSDS.

- . Fire and Explosion Hazard Data Section
- Reactivity Data Section
- . Precautions for Safe Handling and Use Section

The following table summarizes the information you will find in the **Fire and Explosion Hazard Data Section** of the MSDS.

Data	Question Answered	Explanation
FLASH POINT	Is it a fire hazard? Is it flammable? Is it combustible?	YES if below 200°F. YES if below 100°F. YES if 100-200°F? Lower is more hazardous.
LEL and UEL	Can it explode in air?	YES if limits given. Low LEL or wide explosive range most hazardous.
EXTINGUISHING MEDIA	What material should be used to put out a fire?	Use protective equipment and special procedures given.
SPECIAL FIRE FIGHTING PROCEDURES	How should firefighters put out a fire?	Use protective equipment and special procedures given.
UNUSUAL FIRE AND EXPLOSION HAZARDS	Is it a fire hazard? Can it explode?	YES if any information is given in either category.

Do **NOT** attempt to put out a chemical fire unless you have been specially trained to do so. Instead, sound the alarm and leave the area.

The following table summarizes the information you will find in the **Reactivity Data Section** of the MSDS.

Data	Question Answered	Explanation
<b>STABILITY</b>	Is it unstable? What conditions should be avoided?	YES if “Unstable” checked. Conditions to avoid are listed.
<b>INCOMPATIBILITY</b>	Is it reactive? What materials should be avoided?	YES if information given. Materials to avoid are listed.
<b>HAZARDOUS DECOMPOSITION PRODUCTS</b>	Does it produce or release a hazard when it decomposes?	YES if any products are listed.
<b>Hazardous POLYMERIZATION</b>	Can it occur? What conditions should be avoided?	YES if “May Occur” checked. Conditions to avoid are listed.

The following table summarizes the information you will find in the **Precautions for Safe Handling and Use Section** of the MSDS.

Data	Question Answered	Explanation
<b>STEPS TO BE TAKEN IF MATERIAL IS SPILLED OR RELEASED</b>	How do I clean up a spill or leak?	Follow specific steps and procedures given.
<b>WASTE DISPOSAL METHOD</b>	What is the proper waste disposal method?	Follow specific methods given and refer to any government regulations.